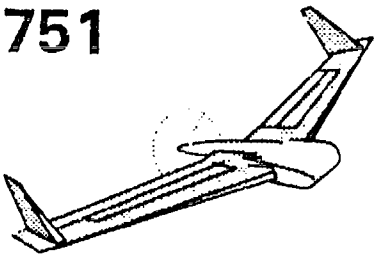
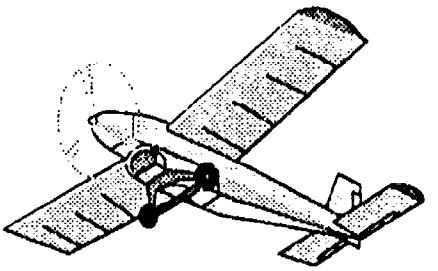
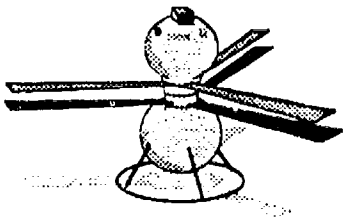
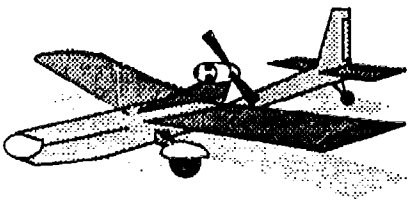
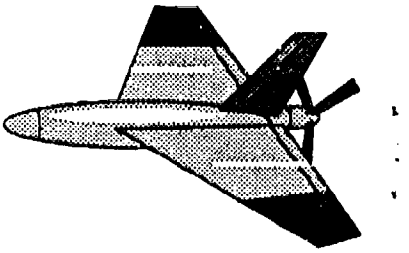






DOD JOINT UAV PROGRAM MASTER PLAN





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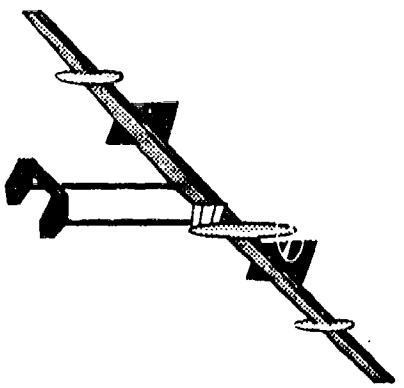

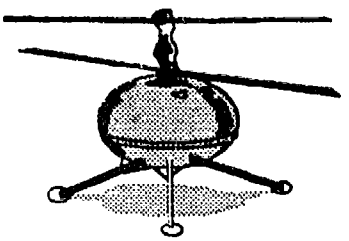

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Developed in response to congressional direction. Describes changes made by DoD to the management of UAV/RPV programs, outlines requirements for capabilities, defines DoD strategy for acquisition of a family of UAV systems, provides explanation of programs to be supported with available FY 1988 and requested FY 1989 funds, and shows planning level funds for FY 1990-1994.

TABLE OF CONTENTS (U)

LIST OF FIGURES

I. INTRODUCTION

A. CONGRESSIONAL DIRECTION

In FY 1988, the Congress eliminated separate program elements for remotely piloted vehicle (RPV) programs within each of the military Services, consolidated these efforts in a Joint RPV Program in the office of the Secretary of Defense, and authorized and appropriated reduced levels of RDT&E and procurement funding for such activities in FY 1988. In addition, the Congress directed that FY 1988 RDT&E funding:

"'. . . is available only for the Joint Remotely Piloted Vehicles (RPV) Program and may not be obligated or expended until the Secretary of Defense submits to the Committees on Appropriation of the Senate and the House of Representatives an updated master plan fully explaining his decisions as to which RPVs will be supported with the available funds and assessing the cooperation by the military Services with efforts to coordinate RPV programs and to eliminate duplication within and among the programs. . ." (Title IV, Public Law 100-180).

This master plan, developed in response to this direction, describes the changes made by the Department in the management of RPV programs, outlines the requirements for RPV capabilities, defines the Department's strategy for acquisition of a family of RPV systems, and provides the detailed explanation of the programs that are to be supported with available FY 1988, and requested FY 1989 funds.

In addition to the direction contained in the Appropriations Act, the committees of the Congress provided the following additional guidance regarding DoD RPV programs.

o That the Office of the Secretary of Defense "should establisn funding and program priorities, mandate requirements for single programs to meet the needs of more than one Service, and eliminate duplicative programs." (Senate)

o That the Joint RPV Program office (JPO) will exercise its coordination and decisionmaking authority over all UAVs being developed by the Services, DARPA, and OSD, including programs considered under NATO and non-NATO cooperative R&D programs and the Foreign Weapons Evaluation program. (Senate)

o That operational concepts, building plans, force structure and training and logistics requirements be considered as the Department merges and manages all the independent Service RPV programs. (Authorization Conference)

o That OSD will eliminate at least one duplicative program and emphasize the development of RPVs which can adequately address the needs of more than one Service. (Senate)

o That only one system will be procured to continue field validation and testing of a short-range NDI system. (House)

o That DoD exercise the fixed-price option to procure four additional PIONEER systems. (Appropriation Conference)

That DoD procure a non-developmental item RPV to meet the needs of all Services for a short-range system. (Authorization Conference)

o That $2.0M be authorized specifically to examine the feasibility of a common test, evaluation, and training center for DoD RPV programs. Such a center would have the responsibility for the testing and evaluating all subsystems for potential use in the RPV environment and to provide the results to the individual Services to enhance their acquisition decisions. Included would be a standardization of test and evaluation procedures that would assure

fair, open competition among the contractors who have the capabilities to support the advancement of RPV technologies. (Authorization Conference)

B. DEFINITION OF TERMS

One of the first considerations in the development or understanding of this master plan is the definition of the terms.

VEHICLE - A self-propelled, boosted, or towed conveyance for transporting a burden on land, sea, or through air or space. (JCS Pub 1-02)

DRONE - A land, sea, or air vehicle that is remotely or automatically controlled. (JCS Pub 1-02)

REMOTELY PILOTED VEHICLE (RPV) - An unmanned air vehicle controlled by a person from a distant location through a communications link. It is normally designed to be recoverable. (JCS Pub 1-02)

AUTOMATICALLY PILOTED VEHICLE (APV) - An aerial vehicle controlled by instructions stored on-board the vehicle and executed automatically.

UNMANNED AERIAL VEHICLES (UAV) - A term that includes unmanned aerial vehicles that are either remotely piloted or automatically piloted. (KP)

LETHAL - Causing irreversible damage or destruction.

NON-LETHAL - Not causing permanent damage or destruction. Includes UAVs with electronic combat payloads.

In this master plan and future correspondence, the term Unmanned Aerial Vehicle (UAV) will be used instead of the more restrictive term Remotely Piloted Vehicle (RPV).

C. SCOPE OF MASTER PLAN

This UAV master plan encompasses non-lethal, unmanned aerial vehicles and their associated sensor, launch, recovery, mission planning and control, data relay and sensor data processing and exploitation subsystems. The master plan includes not only those programs funded in the DoD Joint UAV Program, but also UAV related activities funded under the Foreign Weapons Evaluation (FWE) Program, the NATO Comperative Testing Program, and Small and Disadvantaged Business Utilization Programs.

UAVs for use exclusively as targets in the testing and evaluation of weapons systems are not included in this master plan.

D. GOAL

It is the goal of the DoD Joint UAV Program to provide cohesive DoD programs that reduce proliferation, maximize joint development and procurement and commonality between the Services and our allies, while reducing unit costs and providing systems to the operational commander.

E. OVERALL STRATEGY

The restructuring of Services' current UAV activities into a joint program effort will be expedited to the extent possible. All DoD Joint UAV Program efforts will be based on Joint Statements of Requirements (JSOR) approved by the Joint Requirements Oversight Council (JROC). Where compromise and prioritization of requirements are necessary, it will be accomplished under the joint direction of JCS and OSD. Only those development and acquisition efforts that contribute significantly to the satisfaction of operational and contingency requirements will be supported.

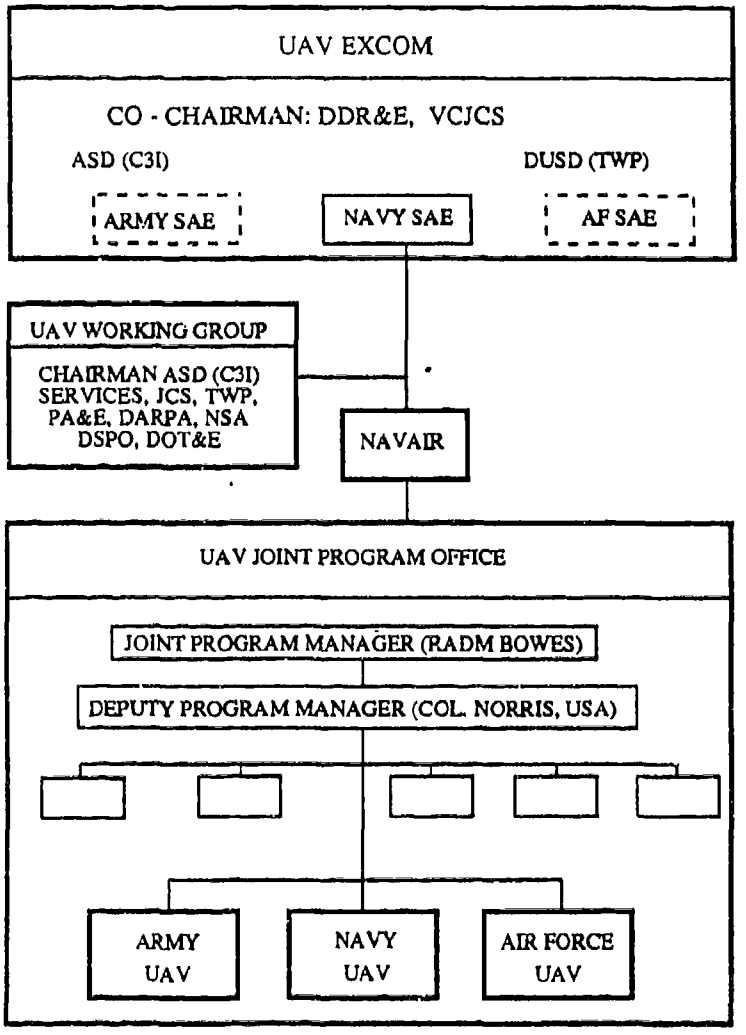
It is the DoD intent to provide needed non-lethal UAV operational capabilities to the commanders with a modular approach that allows for the greatest commonality among components. This approach is highly desirable in that it also will reduce the number of end items of equipment and provide for standardization within the battle environment while allowing the greatest opportunity for cost reduction, manpower savings and standardized training. UAVs will ultimately include survivability enhancements to reduce the likelihood of detection or destruction. Both recoverable and expendable applications of UAV technology will be developed to accommodate a variety of missions while maximizing cost-effectiveness. It is essential that US and allied industry be encouraged to participate in the development of UAV technologies.

F. COORDINATION

Since the creation of the DoD Joint UAV Program, the primary focus has been on establishing the OSD and JPO management structures, reaching agreement on the overall near and long-term acquisition strategies and developing this UAV master plan. Given the limited time available, this UAV master plan is focused on providing the detailed descriptions of programs and projects to be funded in the DoD Joint UAV Program in FY 1988 and FY 1989. In the process of building this master plan, a wide range of non-lethal UAV activities not found in the DoD Joint UAV Program were identified and reviewed. In the formulation of the FY 1990-94 budget, further consolidation of DoD UAV activities in the Joint UAV Program will be addressed. In some cases, DoD Joint UAV Program activities will have to be closely coordinated with the Airborne Reconnaissance Support Program (ARSP), Tactical Cryptologic Program (TCP), and with projects funded in Foreign Weapon Evaluation, NATO Cooperative, and small business programs. With respect to target drone and lethal UAV programs, it is recognized that close coordination is essential. The UAV Joint Program Office (JPO) will be responsible for establishing and maintaining coordination with organizations such as the Joint Airborne Expendable Drone Office (JAEDO). In addition the JPO will be responsible for coordinating U.S. and allied UAV activities.

II. MANAGEMENT

In response to action by the Congress, Navy and Army, in December 1987, initiated a joint Service effort to identify and reach agreement on a joint approach to the development and acquisition of UAV capabilities. This effort resulted in the approval in February 1988 by all three military departments of an agreement in principle on the acquisition of UAV capabilities. This master plan builds on the management and acquisition agreements reached by the Services. The following figure depicts the structure established to manage the Joint UAV Program.



A. UAV EXECUTIVE COMMITTEE

The Congress assigned responsibility for the management of all DoD UAV activities to the Office of the Secretary of Defense. In response to this direction, the Under Secretary of Defense (Acquisition) established the UAV Executive Committee (UAV EXCOM) on 7 April 1988. Co-chaired by the Director, Defense Research and Engineering and the Vice Chairman Joint Chiefs of Staff, the UAV EXCOM includes the Service Acquisition Executives (SAEs), the Assistant Secretary of Defense (Command, Control, Communications, and Intelligence), and the Deputy Under Secretary of Defense (Tactical Warfare Programs). The UAV EXCOM has overall responsibility for the DoD Joint UAV Program. In addition to the activities funded in this OSD program, the UAV EXCOM has responsibility for the oversight of all UAV activities of the Department.

B. UAV WORKING GROUP

The UAV Working Group was established on 7 April 1988 to conduct those activities required by the UAV EXCOM. Chaired by the ASD(C3I) Director Tactical Intelligence Systems, the UAV Working Group includes representatives of each of the UAV EXCOM member agencies plus the National Security Agency (NSA), Defense Advanced Research Projects Agency (DARPA), Airborne Reconnaissance Support Program (ARSP), UAV JPO and other designated elements of the OSD staff. The development of this UAV master plan was the first task assigned to the working group.

C. UAV JOINT PROGRAM OFFICE (JPO)

The JPO has been established to manage the day-to-day activities required for the planning, programming, budgeting, development, and acquisition of UAV platforms, sensors, datalinks, launch and recovery systems, and mission planning, sensor control and data exploitation capabilities. In addition, the

JPO will be responsible for the management of UAV test and evaluation activities. The charter for the JPO is being drafted.

In FY 1988 the Congress eliminated individual Service program elements for RDT&E and Procurement and directed the establishment of the OSD Joint UAV Program. The FY 1989 Amended Budget Submission for the Department of Defense reflects that consolidation of Service RDT&E and procurement in the OSD program. However, certain Service and Defense agency funds for 6.2 technology development, UAV operations and maintenance, and UAV-related projects in the DARPA, TCP, ARSP, NATO and non-NATO cooperative programs, and Foreign Weapons Evaluation programs are funded in separate accounts. Decisions on any further consolidation of UAV activities in the Joint UAV Program will be made by the UAV EXCOM on a case-by-case basis. The UAV JPO will be responsible for the coordination of all non-lethal UAV activities.

All Service and Defense Agency UAV programs that are exclusively for non-lethal missions will be managed by the UAV JPO. Services and agencies will receive direction and funding from the UAV EXCOM through the Navy as executive Service, to the UAV JPO. Programs will be baselined (e.g., defined with regard to cost, schedule, performance and risk) by the UAV JPO. The UAV JPO will render performance and effectiveness reports on all personnel assigned to the JPO, regardless of Service or agency.

Service and Defense Agency programs that support, but are not exclusively for, non-lethal missions will be the responsibility of the Service or Defense Agency management chain. These programs will be baselined by the Service or agency SAE.

III. REQUIREMENTS

A. INTRODUCTION

UAV systems provide a technical alternative to manned aircraft and satellite systems. The definition of the operational requirements for which UAV systems offer the best solution will involve the JPO, tne Services, Unified and Specified Commands (U&S), and the JCS. The JPO will have available the results of previous DoD UAV experience, knowledge of advanced UAV technologies and concepts. The Services will have to assess the relative merits of unmanned, manned, and satellite systems and make a decision on those mission area requirements for which UAVs offer the best solution. The views of the U&S commands on the requirements best satisfied by UAV systems will provide yet another input to the process.

The Joint Statements of Requirements (JSORs) that result from this process will be forwarded to the UAV EXCOM for review, and to the UAV JPO for execution. The UAV JPO will provide to the EXCOM an acquisition strategy, detailed specifications upon which systems will be based, and proposed funding. This process will enable the UAV EXCOM to direct maximum commonality in systems and components, and to mandate single programs for meeting the needs of more than one Service and more than one U&S Command when warranted.

The acquisition strategy reflected in this master plan is based on the recognized need to test, refine, and adjust the operational concepts and desired performance parameters that are identified as the result of the requirements process. The initial concepts and performance requirements devised for UAV objective systems to be developed and acquired in the 1990s are discussed in detail in this section. The strategy is to use currently available UAV systems such as PIONEER, AQUILA, and AMBER to test and refine the requirements during FY 1988 and FY 1989 in order to be prepared in FY 1990 to initiate programs to jointly develop and acquire UAV systems that are both effective and affordable.

B. REQUIREMENTS BACKGROUND

Commanders' requirements for non-lethal UAVs are driven by the need for intelligence targeting and battle management information. The role of non-lethal UAVs among these applications varies with the method and purpose of employment, data timelines, and resolution requirements.

Intelligence and targeting are generally the most easily recognized requirements for non-lethal UAVs. However, support to the commander's direct battle management is a capability offered by UAV technology because it is possible for him to view the battlefield in real-time, even at lower tactical echelons. Additional UAV applications that support the commander's decision making are those which allow him to observe activity or environments relative to friendly operations. Non-lethal UAV systems can provide support in the following areas:

Reconnaissance and Surveillance-

Definitions:

Reconnaissance -- A mission undertaken to obtain, by visual observation or other detection methods, information about the activities and resources of an enemy or potential enemy; or to secure data concerning the meteorological, hydrographic, or geographic characteristics of a particular area. (JCS Pub 1-02)

Surveillance -- The systematic observation of aerospace, surface or subsurface areas, places, persons, or things, by visual, aural, electronic, photographic, or other means. (JCS Pub 1-02)

The capability to provide reconnaissance and surveillance support with UAVs requires a day and night sensor; e.g., IMINT, ELINT, COMINT, MASINT which extends the vision of the user. The application of this capability supports the intelligence, targeting and decision making processes. UAV reconnaissance

and surveillance operations will be either cued or uncued depending on the operational concept. The fundamental requirement is to provide an ability to detect, recognize, and identify targets of interest within the timelines required to support a user with specific responsibilities.

Target Acquisition

Definitions:

Target -- (1) A geographical area, complex, or installation planned for capture or destruction by military forces. (2) In intelligence usage, a country, area, installation, agency, or person against which intelligence operations are directed. (3) An area designated and numbered for future firing. (4) In gunfire support usage, an impact burst which hits the target. (JCS Pub 1-02)

Target Acquisition -- The detection, identification and location of a target in sufficient detail to permit the effective employment of weapons. (JCS Pub 1-02)

The capability to provide target acquisition support with UAVs requires a day and night sensor capability that will support the resolution of targets to the point that they may be detected, recognized, and located with sufficient accuracy that they may be struck with supporting weapons systems.

Target Spotting

Definition:

Spotting -- A process of determining by visual or electronic observation, deviations of artillery or naval gunfire from the target in relation to a spotting line for the purpose of supplying necessary information for the adjustment or analysis of fire. (JCS Pub 1-02)

Naval gunfire spotting team -- The unit of a shore fire control party which designates targets; controls commencement, cessation, rate, and types of fire; and spots fire on the target. (JCS Pub 1-02)

Field artillery observer -- A person who watches the effects of artillery fire, adjusts the center of impact of that fire onto a target, and reports the results to the firing agency. (JCS Pub 1-02)

The capability to support weapons application with UAVs includes both visual observation, that could be accomplished through the employment of a reconnaissance and surveillance-type UAV to extend the view of the user, and electronic support such as target designation. Requirements for this operational capability vary widely and drive sophistication necessary to meet the stated need.

Command and Control (C2)

Definition:

Command and Control -- The exercise of authority and direction by a properly designated commander over assigned forces in the accomplishment of the mission. Command and control functions are performed through an arrangement of personnel, equipment, communications, facilities, and procedures employed by a commander in planning, directing, coordinating, and controlling forces and operations in the accomplishment of the mission. (JCS Pub 1-02)

Bomb Damage Assessment (BDA) -- The determination of the effect of all air attacks on targets (e.g., bombs, rockets, or strafing).

The ability to provide support to the commander with UAVs through communications relay and troop control. Direct viewing of the battlefield by the commander and use for friendly BDA are functions of C2 which are possible

through UAVs. Such UAV operations will support commanders in C3-protection, as well. (See Disruption and Deception below.)

Meteorological Data Collection

Definition:

Meteorological Data -- Meteorological facts pertaining to the atmosphere, such as wind, temperature, air density, and other phenomena which affect military operations. (JCS Pub 1-02)

The capability to provide meteorological data in the target area to support weapons employment and planning through use of the UAV will greatly enhance the commander's information about his environment. Such information is extremely useful in operations planning and weapons application.

Nuclear, Biological and Chemical (NBC) Detection

Definition:

NBC detection -- the determination and transmission by a surveillance system that an enemy chemical, biological or radiological operation has occurred.

The capability to provide forewarning of NBC activity at a distance through use of the UAV will allow for greater protection of forces and enable the application of effective counter-measures.

Disruption and Deception

Definition:

Deception -- Those measures designed to mislead the enemy by manipulation, distortion, or falsification of evidence to induce him to react in a manner prejudicial to his interests. (JCS Pub 1-02)

Military deception -- Actions executed to mislead foreign decision-makers, causing them to derive and accept desired appreciations of military capabilities, intentions, operations, or other activities that evoke foreign actions that contribute to the originator's objectives. (JCS Pub 1-02)

Command, Control and Communications countermeasures -- The integrated use of operations security, military deception, jamming, and physical destruction supported by intelligence, to deny information to, influence, degrade, or destroy adversary command, control, and communications (C3) capabilities, and to protect friendly C3 against such actions. Also called C3CM. There are two divisions within C3CM. (JCS Pub 1-02)

a. Counter-C3. That division of C3CM comprising measures taken to deny adversary commanders and other decisionmakers the ability to command and control their forces effectively. (JCS Pub 1-02)

b. C3-protection. That division of C3CM comprising measures taken to maintain the effectiveness of friendly C3 despite both adversary and friendly counter-C3 actions. (JCS Pub 1-02)

The capability to provide disruptive, deceptive, and counter-C3 devices to the commander through the use of the UAV will allow for greater influence upon the enemy's intentions and operations and will assist in the execution of tactical and operational plans.

C. Service Needs

Army

The Army requires an ability to operate at depth in order to execute the AirLand Battle doctrine. This generates extensive requirements for reconnaissance and surveillance, target acquisition, target spotting, command and control, meteorological data collection, NBC detection, disruption and deception operational capabilities. Applications of these operational capabilities are needed over the entire battlefield to complement or replace existing equipment, and, in many cases, to provide unique capabilities not yet

realized. Exercises and operations have repeatedly demonstrated major deficiencies in these operational areas which can be substantially satisfied by non-lethal UAVs.

The non-lethal UAV operational capabilities, as described in this plan, are required by commanders at different Army echelons, for varying employments, and with differing timeline requirements. All commanders require a capability to support weapons targeting in their area of responsibility by weapons under their control.

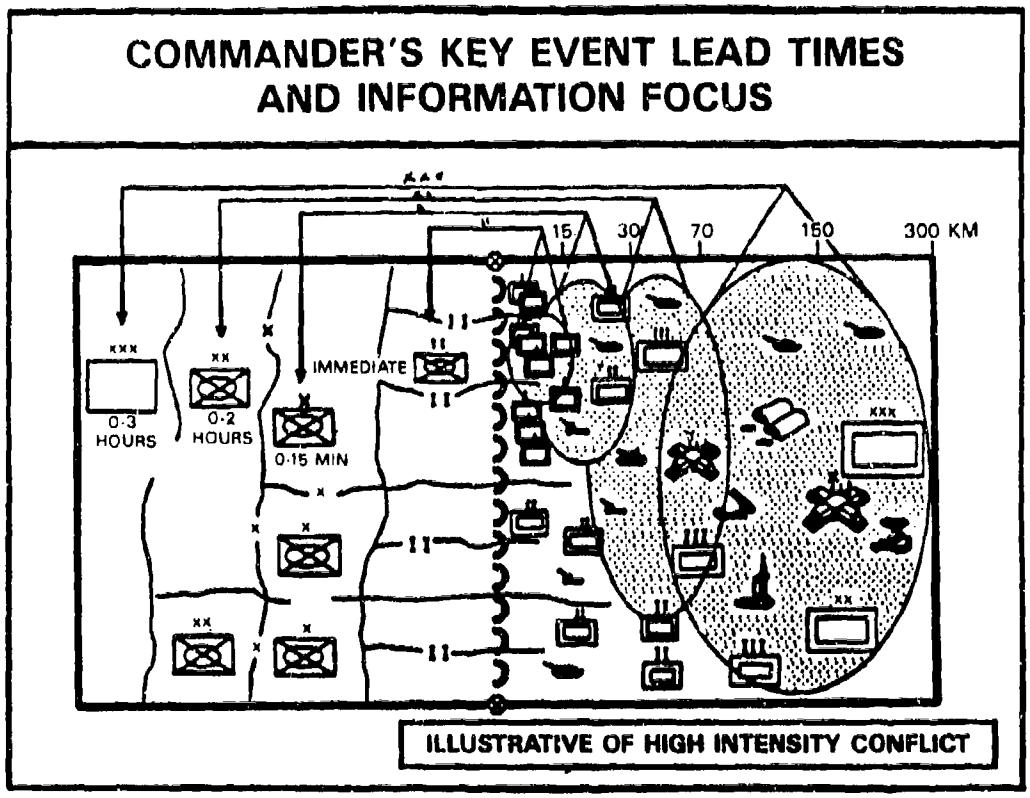
The battalion commander needs reconnaissance and surveillance and target acquisition support to execute his responsibilities on the battlefield. The battalion commander fights the first echelon of committed regiments, which is best represented by the tanks, artillery pieces and armored personnel carriers of maneuver and artillery forces. The speed with which this commander's battles are fought, and the time sensitivity of his decisions dictate immediate responsiveness to his needs and a UAV endurance of three to six hours. The battalion commander's requirements are based on a need to see and strike targets within his area of responsibility, which is approximately 15 km beyond the front line of troops (FLOT).

The brigade commander needs reconnaissance and surveillance, target acquisition and target spotting support in the execution of his responsibilities on the battlefield. The brigade commander fights the enemy's first echelon of reserve or uncommitted regiments which is best represented by the immediate reinforcements (tanks, artillery pieces and armored personnel carriers) available to assist the execution of the battle in the battalion commander's area of responsibility. These forces are not yet committed to battle and the knowledge of when, where and in what force the enemy will commit these immediately available reinforcements is most valuable information. Prosecution of the brigade battle requires near real-time information support, essentially from less than a minute to 15 minutes. The brigade commander requires a UAV system with endurance of three to six hours.

He must be able to see and strike targets within his area of responsibility, which is out to approximately 30 km beyond the FLOT.

The operational capabilities needed by the division commander are reconnaissance and surveillance, target acquisition, target spotting, command and control, meteorological data collection, NBC detection and disruption and deception. Although the division battle is relatively slower, the forces and targets a division commander faces is significantly different and varied, and therefore more complex. First he must destroy the first echelon division reserve forces and the enemy command and control systems. The division commander also must destroy or disrupt the fire support, reinforcement, intelligence collection and communications of his enemy. The division commander requires near real-time information on high value targets, and up to two hours turnaround on others, and a system with endurance to support operational capabilities for six to 12 hours. This is based on his need to see and strike targets (out to approximately 30 km) and influence enemy plans. The division commander's area of responsibility for the conduct of reconnaissance and surveillance is out to approximately 90 km beyond the FLOT.

In his fight against the first echelon Army reserves and the potential Front counter attack, the Corps commander's needs are similar to the division commander's. Therefore, he requires similar operational capabilities: reconnaissance and surveillance, target acquisition, target spotting, command and control, meteorological data collection, NBC detection, disruption and deception. His battle, however, is conducted at far greater depths (out to approximately 300 km) and against many high value targets such as command and control, intelligence, sustainment, and fire power operating systems; that is, targets with the ability to stand off to greater depth but whose impact is such that it may have a devastating impact on the battle. Additionally, the Corps commander must destroy, delay, or disrupt the enemy's reinforcement of the battle. The great variety and dispersal of the Corps commanders' targets dictates requirements for a corresponding variety of operational capabilities to acquire, locate and strike distant targets. UAVs must provide the ability to provide targeting support out to at least 150 km. The combination of high



value targets and situation development responsibilities equates to a requirement for near real-time to three hour information turnaround, and system endurance of six to 12 hours.

The technology available for non-lethal UAVs allows for the satisfaction of the many long-standing battlefield deficiencies for these echelons of command. The need to see and influence the battlefield and to provide for communications support at greater depth can be accomplished with UAVs while reducing the risk to personnel. Enemy doctrine identifies echelonment of forces at depths greater than the U.S. Corps commander's area of responsibility (approximately 300 km). The Air Force is charged with that

area of responsibility in AirLand Battle doctrine. The Medium Range UAV will augment satellite and manned reconnaissance capabilities to monitor enemy activities beyond 300 km.

USMC

The UAV offers a uniquely flexible capability to gather information on enemy and friendly forces, and characteristics of the amphibious objective area (AOA), and enhance tactical command and control. UAVs must provide the Marine Air-Ground Task Force (MAGTF) commander expanded multi-sensor collection and aerial observation capabilities, and extend the range of tactical communications. They must provide an immediate response capability for the infantry battalion or company commander within his area of responsibility.

All mid-range and long-range planning for the Marine Corps is based on 23 mission areas. The potential of UAVs is evidenced by their projected contribution to 15 of 23 mission areas.

The MAGTF commander requires UAVs to provide general or direct support to the MAGTF by conducting real time, day and night reconnaissance, target acquisition and battlefield surveillance, gunfire adjustment, and tactical communications relay operations. Assigned UAV tasks in support of the MAGTF already include:

--timely detection, recognition, identification, and location of targets

--control of close air support, immediate adjustment of direct and indirect fire weapons to include battle damage assessment (BDA)

--conducting real-time reconnaissance, surveillance, and intelligence collection

--providing support for rear area security

--assisting in search and rescue (SAR) and helicopter route and landing zone reconnaissance

--providing airborne tactical radio relay

--conducting electronic combat missions

The use of equipment capable of operating in amphibious environments is mandated by the expeditionary nature of the Marine Corps' missions and roles. In terms of UAV system configuration, the systems must be modular, technically supportable in austere operational conditions, operable by a minimum number of Marines with basic MOS skills, and must offer the maximum in mission flexibility, while maintaining a minimum amphibious lift fingerprint.

The requirements and mission tasks for the UAV indicate the need for several air vehicles operating with a central, modular ground control facility. The Marine Corps' concept for UAV operations treats the air vehicle as merely an airborne truck capable of carrying different plug-in and out mission payloads. A melding of missions, command levels requiring support, and air vehicle and payload parameters results in the following breakdown:

--The infantry company or battalion commander requires a lightweight, man-portable system to operate out of line of sight (LOS). This system should enable real-time observation at close ranges including urban terrain. The system should provide day and night video display for control of friendly forces, surveillance of enemy forces, and adjustment of fire for forces in enemy contact.

--The MAGTF commander needs a UAV system for real time command and control of on-going operations. This includes pre-assault and assault missions, as well as more traditional power projection missions. Airborne tactical communications relay must be continuously available and video of friendly forces must be accessible as required. UAV systems must also provide targeting support to the MAGTF commander to acquire and recognize targets, adjust indirect fire, and provide battle damage assessment.

--There is an urgent requirement for the MAGTF commander to maintain continuous SIGINT coverage. Besides long endurance, UAV systems should have a modular payload capability to allow the system to be rapidly configured to cover the threat.

--The MAGTF commander's intelligence needs also dictate a capability for acquiring high resolution multi-sensor imagery that can be down linked directly from a UAV to the Joint Service Imagery Processing System. This imagery must be available even if the target is protected by a high threat air defense envelope. Imagery must be acquired on targets capable of presenting a threat to the MAGTF.

--The MAGTF commander also has a need to conduct electronic combat operations. This includes a capability for a low power barrage jammer to disrupt enemy UHF and VHF communications.

Navy

Worldwide Naval Operations have dictated an urgent requirement for a UAV capability to complement and augment other intelligence gathering, target acquisition, target spotting and communications relay capabilities. Recent operations have graphically demonstrated gaps in the above-mentioned capabilities which could be filled by UAV systems. Both War-at-Sea and Power Projection Ashore scenarios indicate that UAVs can be of great benefit to the operational commander as an option to present systems.

The Battleship Battle Group (BBG) commander has a requirement for a UAV in both the War-at-Sea and Power Projection Ashore operational scenarios. The requirement is for a real-time UAV system attached to the BBG in direct support of BBG operations. The capabilities required include target spotting, target acquisition, and surveillance in support of both sea and amphibious operations. The system must have the capability of performing its missions beyond the reaches of the battleship's primary weapons systems (approximately

100 nm), and be able to remain in the target or operational area for a significant period of time (5-7 hours). There are additional requirements for UAV systems which can perform long endurance communications relay and surveillance missions for the entire BBG. In addition, the battleship's longer range weapons require a capability to cue their target acquisition systems. The radius of action of such a UAV would be 350 nm with an additional requirement to interface with mission planning units for the longer range weapons of the battleship.

Requirement exists for UAV systems to support the Carrier Battle Group (CVBG) commander. The CVBG has mission support requirements to include reconnaissance and target acquisition. These reconnaissance functions are presently accomplished by utilizing manned reconnaissance platforms (F-14/ TARPS, RF-4B). With today's threat environment and the assumed future threat environment, the CVBG commander needs to have an alternative to placing manned reconnaissance aircraft at risk. A UAV system would carry the same sensors as the manned reconnaissance platform and have a similar radius of action (approximately 350-450 nm). This would provide the CVBG commander with the alternative reconnaissance and target acquisition capabilities needed to make operational decisions.

Finally, a requirement exists for a small ship, such as a destroyer or fast frigate (DD or FF), to have its own UAV capability. There is a need for small ships to have surveillance, target spotting and EW capabilities. The radius of action requirements of such systems is less than the BBG based on the reduced range of small ship weapon systems and area of responsibility. In addition to the reduced radius of action requirement, it is essential that no additional ship personnel be required to launch, recover, and operate such a system.

Air Force

UAVs are viewed as complementary to existing manned systems, while providing capabilities not yet available. The Air Force AirLand Battle requirement parallels the Army requirement encompassing support to Army commanders at echelons from battalion to Army Group with reconnaissance and surveillance, target acquisition, target spotting, and command and control countermeasures. The USAF requires a mid-range UAV capable of carrying the common Advanced Tactical Airborne Reconnaissance System (ATARS) sensor suite. The USAF UAV must also be air-launchable and capable of autonomous operations. The USAF UAVs will complement USAF manned tactical reconnaissance systems. Additionally, the Air Force has unique Service requirements in support of airbase operability, Post Attack Launch and Recovery (PALR), Operational Counter Air (OCA), and C2 protection of high value airborne assets. Airbase operability in support of the airbase commander is required to maintain airbase operations in the face of enemy attack. The base commander is faced with protecting an area sometimes five square miles in size from both ground and air threats. Additionally, the commander may be using an operating base where security and attack recovery capabilities are limited to those brought in at the time of deployment. This requires determination of the Minimum Operating Strip (MOS) within 25 minutes after enemy attack, discovery of unexploded ordinance and determination of the extent of damage to the airfield and its supporting facilities. This requirement is characterized by reconnaissance and surveillance of the perimeter and interior, NBC detection (detection, location, recognition, determine drift pattern and concentration), disruption and deception of attacking forces, command and control (provide communications linkage between units on base and between bases where line of sight may be blocked), meteorological data collection (to determine drift pattern of radiation or chemicals and for launch and recovery of aircraft), BDA (to determine the extent of enemy derived damage to the airfield and the impact on airfield operations), and command and control countermeasures.

SEAD must be provided to all aircraft operating in enemy air space. The use of a combination of manned, unmanned, lethal and non-lethal assets is planned. Here deception and disruption (of enemy air defenses and C2), reconnaissance and surveillance (location of enemy air defenses and C2), meteorological data (for weapons employment), command and control (coordination of Blue Assets), target spotting and post strike BDA, and target acquisition (in support of lethal manned and unmanned assets) are required.

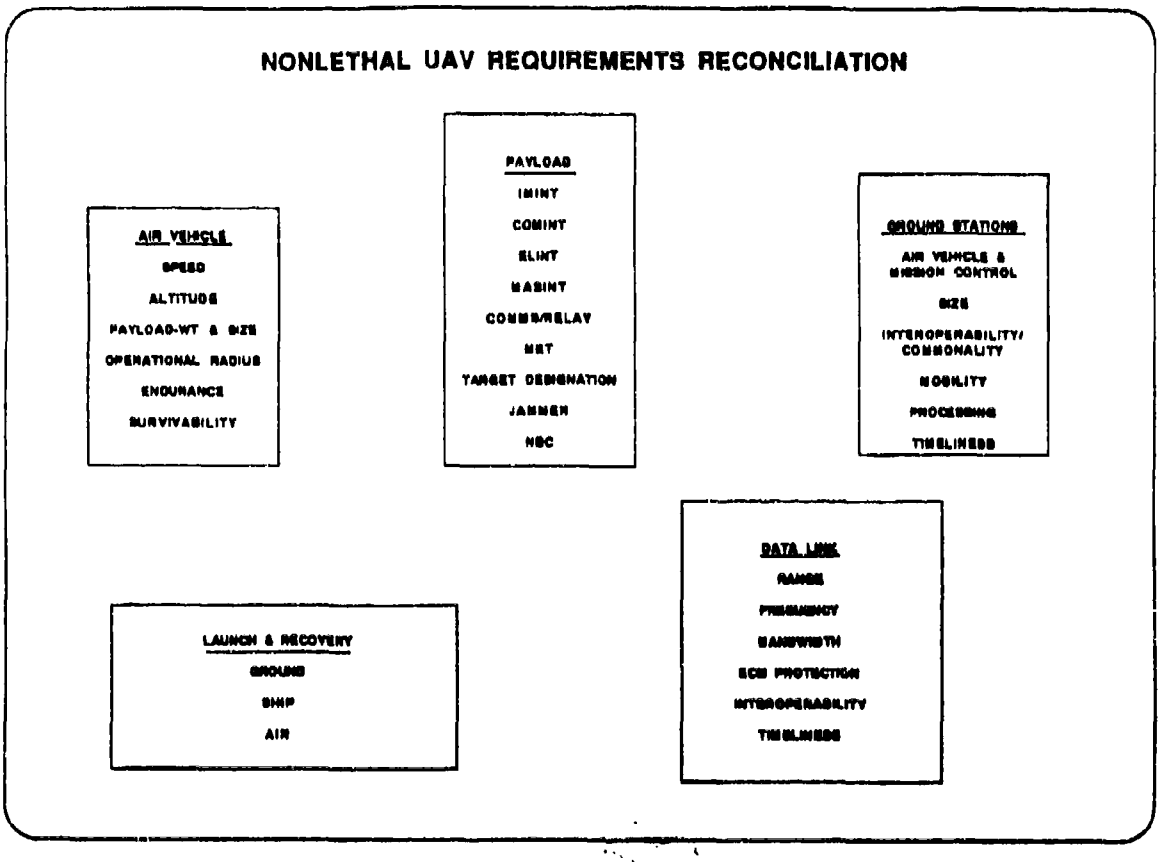
D. Reconciliation of Service Requirements

The DoD goal for UAV development is to provide the required capabilities and, within practical limits, achieve commonality, interoperability, and standardization in hardware, software, training, integrated logistic support. It is essential that these systems be designed and integrated into existing operating systems and force structures.

To this end, the JCS reviewed and compared individual Service requirements and identified common requirements for UAV capabilities. DoD will continue requirements analysis and refinement during the test and evaluation of UAV systems in FY 1988 and 1989. The resulting Joint Statements of Requirement (JSOR) will be the basis for the development and acquisition of objective UAV systems in the 1990s.

E. DoD Non-lethal UAV Requirements

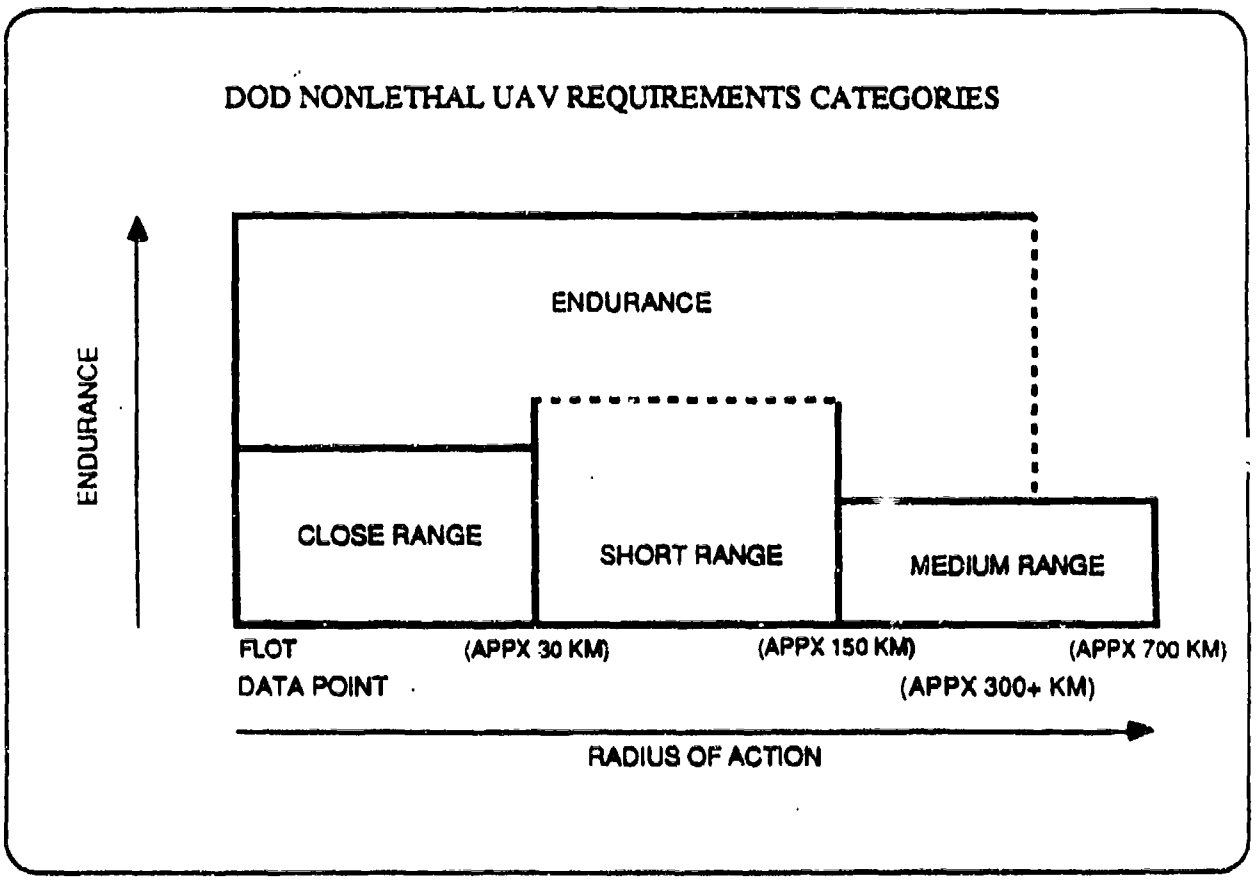
UAV systems consist of air vehicles, payloads, launch and recovery station(s), data links, and ground station(s). Each of these components has subcomponents and technical characteristics that must be analyzed and understood to produce an objective system with the greatest commonality, while maintaining the essentials of the requirement. The diagram on the following page represents the components of a UAV system and identifies relevant factors of each which drive commonality and differences among Service requirements.



It is the component nature of the UAV system which causes the difficulty in designing "one" system to meet all needs. But, it is also the component nature of UAV systems that allows for maximum flexibility in achieving commonality while providing the required capability. The analysis of

components, subcomponents, and technical characteristics and requirements reconciliation be on-going processes. Dialogues between requirements and acquisition representatives must continue until the system is fully described and determined to be technically feasible and affordable. This master plan does not answer all reconciliation issues at this point. More analysis with requirements, acquisition, technical experts, industry, and operational units will be conducted.

The current reconciliation process has defined and described four categories of non-lethal UAVs: close, short, medium range, and endurance. Previously the non-letnal UAV requirement has been discussed solely in terms of range. Although range is a principal consideration in most UAV missions, it is not the only consideration. In the reconciliation of Service requirements into a series of joint requirements, it was apparent that an endurance requirement was a discriminating factor which stood apart from range and, in some cases, facilitated Service requirements reconciliation. DoD non-lethal UAV requirements therefore will be addressed in these four categories:



The following matrix provides the required operational capabilities and system descriptions of the four categories of DoD Non-lethal UAV requirements. Each of the four categories is discussed in a separate overview following the matrix.

MATRIX OF DOD NONLETHAL UAV REQUIREMENTS

	CLOSE RANGE	SHORT RANGE	MEDIUM RANGE	ENDURANCE
REQUIRED BY	A,MC, N, AF	A, MC, N, AF	MC, N, AF	A, MC, N, AF
OPERATIONAL CAPABILITIES	RECON/SURV TGT ACQ TGT SPOT DISRUPTION AND DECEPTION (D2)	RECON/SURV TGT ACQ TGT SPOT C2 *MET D2 *NBC	RECON/SURV MET	RECON/SURV C2 TGT ACQ MET NBC
LAUNCH & RECOVERY	LAND/SEA	LAND/SEA	AIR/LAND	LAND/SEA
RADIUS OF ACTION	TO 30 KM	TO 150 KM	TO 700 KM	TO 300 KM
SPEED	NOT SPECIFIED	DASH BETWEEN LOITER POINTS	HIGH SUBSONIC	NOT SPECIFIED
LOITER	1 TO 6 HRS	6 TO 12 HRS	NONE	TO 36 HRS
INFO TIMELINESS	<1 MIN	<1 MIN TO 3 HRS	<1 MIN TO TURNAROUND TIME	<1 MIN
SENSOR TYPE	IMAGING JAMMER	IMAGING *JAMMER DESIGNATOR *MET COMM RELAY *NBC	IMAGING MET	SIGINT *MET COMM RELAY *NBC IMAGING *MASINT
AIR VEHICLE	REMOTE & TETHERED	REMOTE	PREPROGRAMMED/ REMOTE	PREPROGRAMMED/ REMOTE
GROUND STATION	MANPACKED/ HMMWV	VEHICLE & SHIP W/REMOTE	JSIPS (PROCESSING)/REMOTE (CONTROL)	VEHICLE & SHIP
DATA LINK	WORLD WIDE/ LOW-HIGH INTENSITY	WORLD WIDE/ LOW-HIGH INTENSITY	JSIPS COMPATIBLE	WORLD WIDE/ LOW-HIGH INTENSITY
CREW SIZE	2	TBD	TBD	TBD

CLOSE RANGE UAV

Tnis category of UAV system is intended to satisfy tne requirements of lower level tactical units and small ships, for a capability to investigate local area activities. The following figure summarizes the joint requirement for Close Range UAV capabilities. UAV systems in this category could be fielded in large numbers and therefore must be low in cost. In addition, such systems must be easy to launch, recover, and operate and require a minimum of manpower and training. The AROD, SPRITE and RAVEN systems, described in Appendix F are examples of this type of system.

CLOSE RANGE UAV REQUIREMENTS

REQUIRED BY ARMY, USN, USMC AND FIR FORCE

OPERATIONAL CAPABILITIES REQUIRED (IN PRIORITY)

- RECONNAISSANCE/SURVEILLANCE - DAY & NIGHT
- TARGET SPOTTING WITHOUT DESIGNATION
- DISRUPTION AND DECEPTION

SYSTEM DESCRIPTION

- LAUNCH & RECOVERY - LAND/SEA BASED
- RADIUS OF ACTION - FLOT/DATUM POINT TO 30 KM
- SPEED - NOT SPECIFIED
- LOITER - 1 TO 6 HOURS
- INFORMATION TIMELINESS - LESS THAN 1 MINUTE TO REPORT
- SENSOR TYPE - IMAGING, JAMMER
- AIR VEHICLE CONTROL - REMOTE & TETHER
- GROUND STATION - MANPACKED/HMMWV
- DATA LINK - WORLD WIDE/LOW TO HIGH INTENSITY
- CREW SIZE - 2

Given the relative simplicity of UAV systems in this category, and the availability of US and foreign systems and funding to support test and evaluation in FY 1988 and 1989, the Close Range UAV is a candidate for early fielding. For the near-term, the objective is to conduct the tests and evaluations of available systems, and document and assess the results in order to provide the basis for selecting the best concepts of operation and refining the performance specifications for an objective system.

The UAV EXCOM will address the issue of whether the objective system(s) will be developed under the normal or rapid prototyping acquisition processes based on the results of the evaluation phase.

SHORT RANGE UAV

This category of UAV system responds to a broad range of requirements of all of the Services. Systems in this category are relatively low speed, moderate in cost and complexity, and provide medium to long endurance surveillance capabilities from low and medium altitudes. PIONEER and AQUILA are examples of such systems.

Army, Navy, USMC, and Air Force have mission area requirements which can best be satisfied by short range unmanned systems. Systems in this category provide a capability for extended close surveillance of enemy activities from the FLOT or datum point out to 150 km and, if feasible, to the limit of the Corps area of interest (300 km). Operating at low altitudes in enemy rear areas providing near-real-time imagery of enemy activities, platform and sensor data would be transmitted directly to a ground station within line of sight, or relayed to that ground station via an airborne or forward deployed relay. The figure on the following page summarizes the joint requirement for Short Range UAV capabilities.

The UAV systems in this category will have different airborne components to provide the range, endurance, payload capability, and survivability required for mission performance. However, the launch and recovery, mission planning, mission control, sensor ground processing and exploitation, data links, and data relay capabilities are expected to be very similar, if not identical, for all short range UAV systems.

DOD NONLETHAL UAV SHORT RANGE REQUIREMENTS

REQUIRED BY ARMY, USMC, ANVY, AND AIRFORCE

OPERATIONAL CAPABILITIES REQUIRED (IN PRIORITY)

- RECONNAISSANCE / SURVEILLANCE - DAY & NIGHT
- TARGET ACQUISITION
- TARGET SPOTTING WITH DESIGNATION
- C2 - COMMAND DIRECT VIEWING
  COMMUNICATIONS RELAY
- DISRUPTION / DECEPTION
- MET
- NBC

SYSTEM DESCRIPTION

- LAUNCH & RECOVERY - LAND / SEA BASED (INCLUDING EXPENDIBLE)
- RADIUS OF ACTION - FLOT / DATUM POINT TO 150 KM
- SPEED - DASH CAPABILITY FROM LOITER POINT TO LOITER POINT
- LOITER - 5 TO 12 HOURS
- INFORMATION TIMELINESS - LESS THAN I MINUTE TO 3 HOURS TO REPORT
- SENSOR TYPE (IN PRIORITY) - IMAGING
  DESIGNATOR
  COMMUNICATIONS RELAY
  JAMMER
  MET
  NBC
- AIR VEHICLE CONTROL - REMOTE
- GROUND STATION - VEHICLE & SHIP MOUNTED WITH REMOTE
- DATA LINK - WORLD WIDE / LOW TO HIGH INTENSITY
- CREW SIZE - ORGANIZATION TBD

MEDIUM RANGE UAV

This category of UAV system responds to Service requirements for a capability to conduct pre- and post-strike reconnaissance in support of strike operations by manned aircraft. The following figure contains a summary of the requirements.

DOD NONLETHAL UAV MEDIUM RANGE REQUIREMENTS

REQUIRED BY USMC, NAVY, AND AIR FORCE

OPERATIONAL CAPABILITIES REQUIRED (IN PRIORITY)

- RECONNAISSANCE / SURVEILLANCE - DAY & NIGHT
- MET

SYSTEM DESCRIPTION

- LAUNCH & RECOVERY - AIR/LAND
- RADIUS OF ACTION - DATUM POINT TO 700 KM
- SPEED - HIGH SUBSONIC
- LOITER - NONE
- INFORMATION TIMELINESS - LESS THAN 1 MINUTE TO TURNAROUND TIME TO REPORT
- PAYLOAD (IN PRIORITY) - IMAGING
  MET
- AIR VEHICLE CONTROL - PREPROGRAMMED AND REMOTE
- GROUND STATION - JSIPS PROCESSING
  REMOTE CONTROL
- DATA LINK - JSIPS COMPATIBLE
- CREW SIZE - ORGANIZATION TBD

The Medium Range UAV provides a quick response capability to obtain the high quality imagery of heavily defended targets that is essential for the selection of specific targets and weapons for air strike operations. These systems provide a relatively low cost complement to manned aircraft for both pre- and post-strike reconnaissance. Moreover these systems do not expose aircrews to the risk of loss or capture. With the rapidly increasing lethality of air defense systems, the use of UAVs for this and other penetrating missions will be increasingly attractive.

ENDURANCE UAV

This category of non-lethal UAV systems responds to a broad range of Service requirements. Systems in this class of UAVs are characterized by longer times of flight than the systems in other categories. Systems in this category provide a demonstrated capability for extended surveillance of enemy activities that are not inherently range-limited. The concentration of developmental effort will initially be on achieving a mission capability for wide-area surveillance using SIGINT and other sensors. Communications relay is a secondary, but important, capability with EO sensors the next area of priority. The following figure contains a summary of the requirements for the Endurance UAV.

DOD NONLETHAL UAV ENDURANCE REQUIREMENTS

REQUIRED BY ARMY, USMC, NAVY, AND AIR FORCE

OPERATIONAL CAPABILITIES REQUIRED (IN PRIORITY)

- RECONNAISSANCE AND SURVEILLANCE - DAY & NIGHT
- C2 - COMM RELAY
- TARGET ACQUISITION
- MET
- NBC

SYSTEM DESCRIPTION

- LAUNCH & RECOVERY - LAND/SEA BASED
- RADIUS OF ACTION - FLOT/DATUM POINT TO APPROXIMATELY 300 KM
- SPEED - NOT SPECIFIED
- LOITER - UP TO 36 HOURS
- INFORMATION TIMELINESS - LESS THAN 1 MINUTE
- PAYLOAD (IN PRIORITY) - SIGINT
  COMMUNICATIONS RELAY
  IMAGING
  MET
  NBC
  MASINT
- AIR VEHICLE CONTROL - PREPROGRAMMED/REMOTE
- GROUND STATION - VEHICLE & SHIP MOUNTED
- DATA LINK - WORLD WIDE, LOW TO HIGH INTENSITY AND INTEROPERABLE WITH MANNED RECONNAISSANCE SYSTEMS
- CREW SIZE - ORGANIZATION TBD

INTEGRATED LOGISTICS SUPPORT (ILS)

Experience gained in DoD UAV system in recent years has demonstrated that ILS must be considered an integral component in the design and acquisition of UAVs. Systems have suffered failures (from single incidents to systemic problems) that have later been recognized as being attributable to some ILS-related cause. The introduction of UAVs into our conventional forces offers an opportunity to demonstrate that considering ILS as an integral component of the system can indeed pay great returns.

The Services have established mechanisms for the full application of integrated logistics support (ILS) methodologies. UAVs are ideal candidates for the maximized cost-effectiveness that proper ILS can promote. The wise use of technology must be combined with increased attention to the necessity of early and complete integration of support in the development and fielding of new defense systems.

The Inter-Service Training Review Organization (ITRO) will be tasked to perform a training analysis to determine the most cost-effective solution to the joint Services training requirements for UAVs. In the interim period, the joint training will be conducted at an Army installation.

IV. DEVELOPMENT AND ACQUISITION STRATEGY

A. PROGRAM OBJECTIVE

The overall objective of the DoD Joint UAV Program is to acquire an affordable family of UAV systems which consists of the best components and subsystems available "off-the-shelf" initially. The systems will be operated by all Services, maximize commonality consistent with the different Service operational missions and environments, and meet Service effectiveness and suitability requirements. Deliveries of objective systems to T&E agencies and to fleet and field units for evaluation, training and contingency operations will begin in FY 1991-1992. UAV systems will be configured so that cost-effective block changes can be made to incorporate advanced developments.

B. SYSTEM CONCEPT

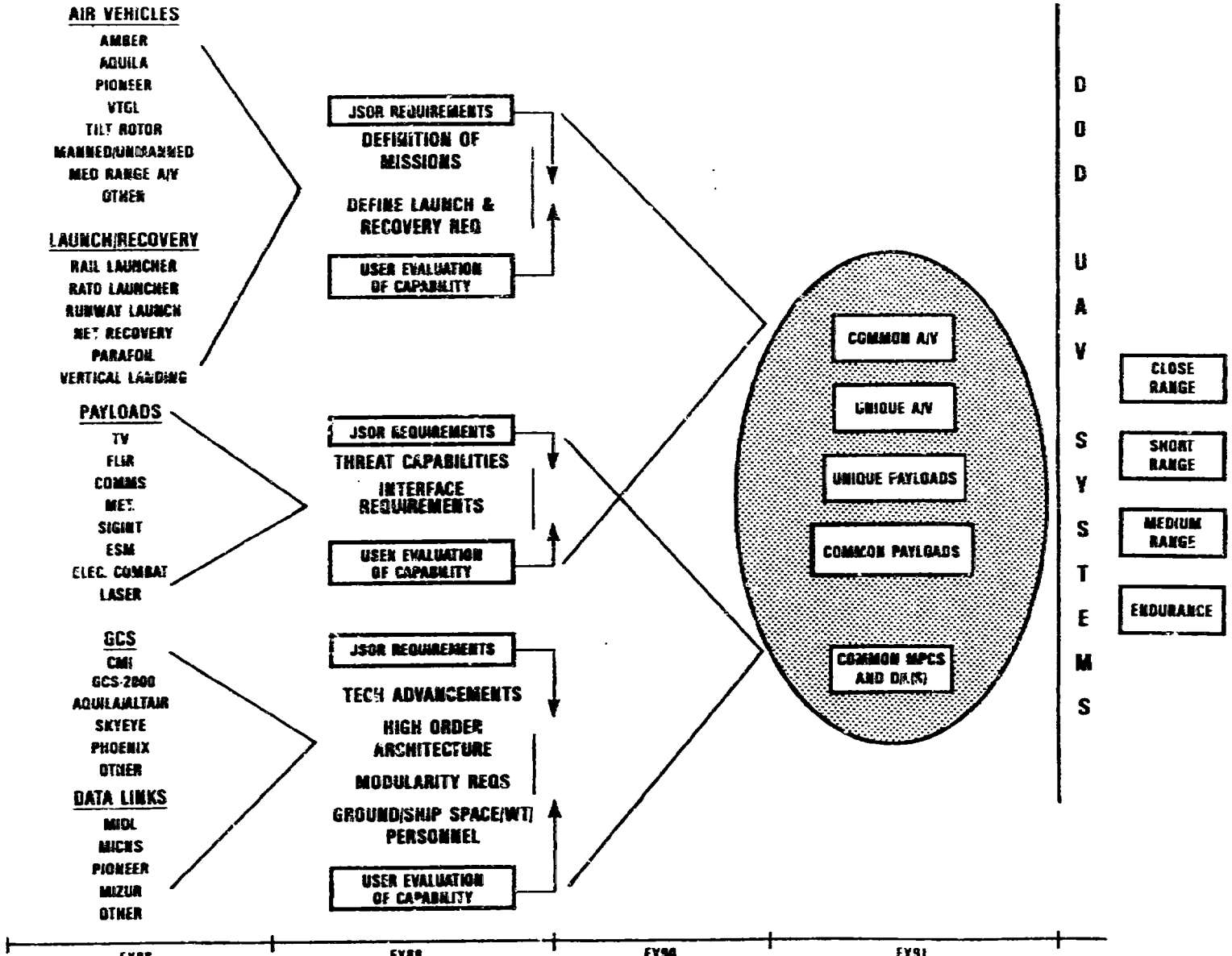
The DoD family of UAV systems will consist of a common modular Mission Planning Control System (MPCS), data links and several different types of air vehicles configured for specific mission areas. Each of the vehicles may employ a number of common payloads. Commonality will be emphasized in the high cost areas of mission planning, command and control, data exploitation, payload packages, training and logistics support. Subsystems which require specific features to meet unique operational or environmental constraints (e.g., airframes) will be developed to maximize mission effectiveness, accommodate unique launch and recovery requirements (e.g., shipboard) and minimize costs.

C. SYSTEM DEFINITION STRATEGY

As shown below, the initial phase in the DoD strategy will make maximum use of existing UAV equipment, systems and lessons learned. Current air vehicles and launch and recovery methods will be compared with JSOR mission requirements, environmental and launch platform constraints to optimize the

close range, short range, medium range and endurance UAV configurations. In like manner, the wide variety of payloads available for UAVs will be evaluated against the mission areas, threat capabilities, interface and interoperability requirements and air vehicle configuration constraints to select the common and unique payloads. Finally, the common Mission Planning Control System (MPCS) configuration requirements will be developed through comparative analysis of existing Ground Control Station (GCS) and data link (DL) equipment, near-term technology advances, the benefits of higher order architecture, and the requirements for modularity to meet the constraints of the various launch platforms (size, weight, volume, power, personnel) defined by the JSOR.

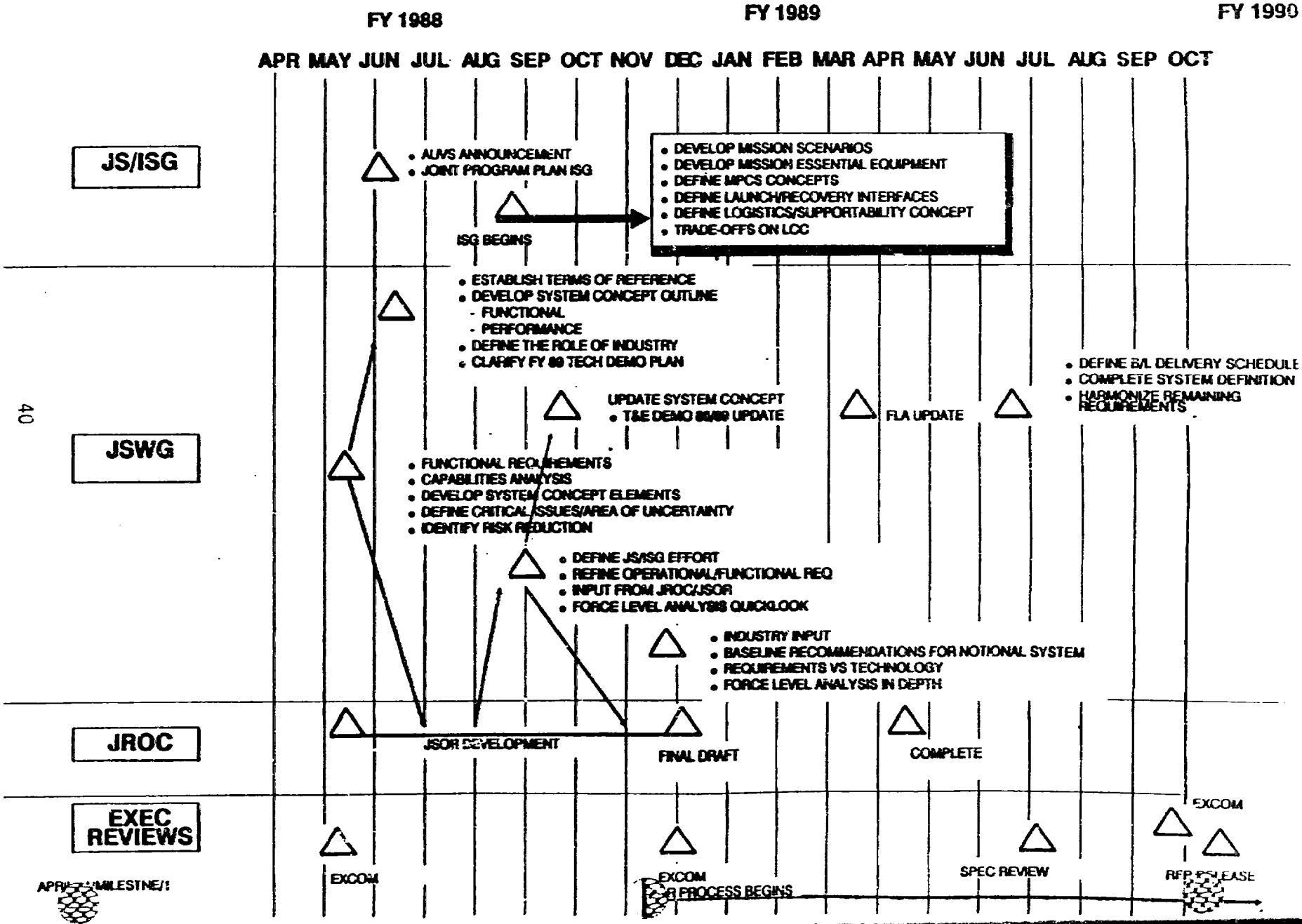
SYSTEM DEFINITION STRATEGY



D. JOINT SERVICES WORKING GROUP

Optimizing the DoD UAV System configuration to meet mission requirements affordably is an iterative process. As discussed previously, the JROC is responsible for developing the JSOR. The UAV JPO has established a Joint Services Working Group (JSWG) consisting of knowledgeable personnel with UAV experience from both developer and user communities. As depicted below, the JSWG will, in concert with the JROC, develop UAV system concepts, define the critical configuration requirements and initially assess force level requirements based on system configuration and operational and organizational concepts. The JSWG and JROC will be advised by a Joint Service and Industry Support Group (JS/ISG) made up of representatives from UAV industry. The JS/ISG will be used as the litmus test for affordability, capability, availability and supportability as the UAV system configurations are being developed.

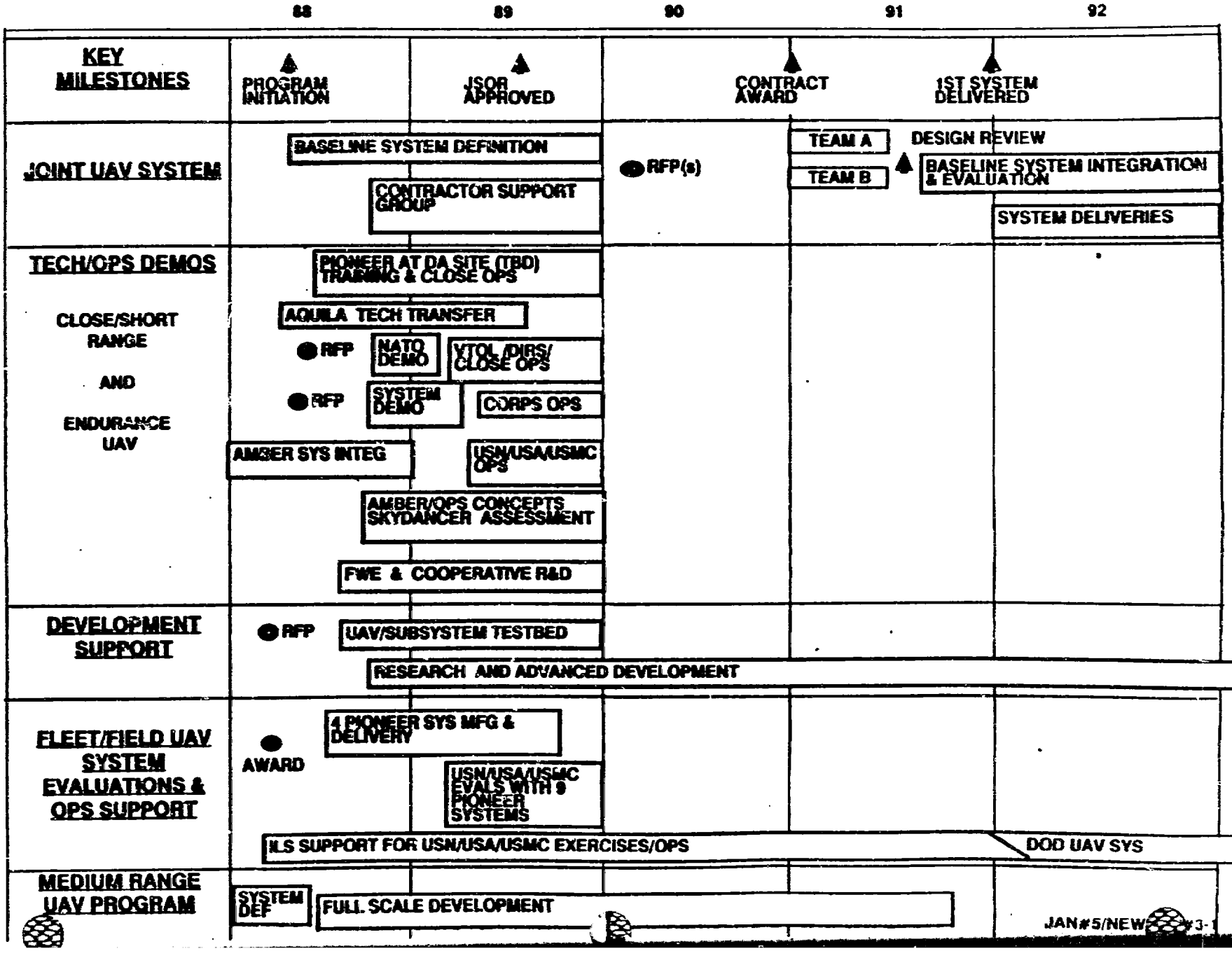
JOINT SERVICES WORKING GROUP PLAN OF ACTION



E. PROGRAM SCHEDULE

The Joint UAV Program schedule is shown below. The system definition phase covers the remainder of FY 1988 and FY 1989. As discussed previously, the JROC and JSWG are the primary forcing functions for the requirements and configurations respectively. The technology and operational demonstrations, development support and fleet and field UAV system evaluations and operations support activities are designed to provide the greatest amount of data in support of the JSOR development and system definition. Testing will be conducted to assess all technology available and to refine UAV system operational concepts and tactical doctrine using existing UAV systems in fleet and field training exercises and on extended deployments. Data gathering will aid the Services in preparing the JSOR and the specifications for the objective UAV systems.

DOD UAV PROGRAM MASTER SCHEDULE



A brief discussion of each of the major activities follows. Additional details on each system test series are provided in appendices A-F (A-Close Range UAVs, B-Short Range UAVs, C-Medium Range UAVs, D-Endurance UAVs, E-Research and Advanced Development, F-Related Programs).

Joint UAV System(s): The objective is to define the configurations of the DoD family of UAV systems that meet the JSORs affordably; to conduct a competition for the system prime contractor(s); and to deliver the systems. An open competition in FY 1990 will be used to select contractor(s). The initial UAV systems will be delivered for T&E activities and fleet and field units as soon as possible. (Targeted for 12 months after contract award.)

Technical and Operational Demonstrations: The objective is to assess the potential effectiveness and suitability of technology available for Close and Short range and Endurance UAVs. The plan is to use complete UAV systems to conduct flight operations to define and refine critical mission area requirements for Close Range, Short Range, Medium Range and Endurance UAV systems. Contractors with UAV systems capable of meeting the requirements for the Short Range (Corps operations) will be invited to demonstrate their systems. Up to three systems may be procured from one of the demonstrating contractors to continue tactics and operations concept development activity, and support urgent contingency operations requirements in FY 1989-1990. Any procurement will be conditional upon force requirements, performance, and suitability of the systems evaluated and affordability. The Joint UAV Technology Center under the direction of the JPO, will facilitate the evaluation of UAV systems, subsystems and technologies. Approved Foreign Weapons Evaluation (FWE) (CL-227, Sprite) and Cooperative R&D efforts (Multi-Optronic Sensor Package project) will be conducted to assess their utility.

Development Support: The objective is to continue development activity critical to UAV system progress. The plan is to conduct development required to define MPCS requirements for ground, shipboard and airborne command and control applications, and to complete time critical components like the heavy

fuel (JP-5) engine required for shipboard use and to commence advanced development activity to support P3I requirement.

Fleet and Field UAV System Evaluations and Operational Support: The objective is to operationally evaluate the effectiveness and suitability of specific subsystems and components on Service UAV systems and to support operational forces and fleet use of UAV systems. The plan is to continue support for the units currently deployed with the Services so that training, tactics development and operational support for contingencies can continue until the objective systems are fielded. Pioneer systems, components, and equipment will be provided to the Marine Corps, Navy, and Army forces. Pioneer training equipment will be used jointly at a common site to support training and Army Close and Short Range development activity. The Army will refurbish and operate existing Aquila assets to capitalize on the program investment to date. The USMC will also operate Aquila in this evaluation phase.

Medium Range UAV: The objective is to continue with the USAF/DON cooperative development of a fully mission capable Medium Range UAV/Target Air Vehicle in accordance with current DON/USAF MOU and approved acquisition strategy. The USAF will integrate the common ATARS sensor suite into the DON-procurred MR-UAV (JSCAMPS), achieving commonality with ATARS and JSIPS. Commonality and interoperability with the DoD family of UAV systems will be achieved wherever practical, but with particular emphasis on the MPCS and data link.

Endurance UAV: The objective is to continue the test and evaluation of AMBER by Navy, USMC, and Army. In addition, AMBER will be used as the platform for the testing of payloads such as MTI radar, communications relay and SIGINT. The results of these evaluations will be used to refine concepts of operation and requirements for the objective Endurance UAV system in the 1990s. SKYDANCER payload development will continue leading to testing on a manned surrogate platform and AMBER.

V. RESOURCES

A. UAV RDT&E

JOINT UAV PROGRAM P.E. 0305141D

RDT&E

	FY88	FY89	FY90	FY91	FY92	FY93	FY94
CLOSE RANGE TOTAL	1.3	5.7	10.0	15.0	10.0	5.0	5.0
AROD	1.3	2.7	0.0	0.0	0.0	0.0	0.0
SMALL SHIP FOLLOW-ON	0.0	3.0	0.0	0.0	0.0	0.0	0.0
CLOSE RANGE OBJECTIVE	0.0	0.0	10.0	15.0	10.0	5.0	5.0
SHORT RANGE TOTAL	14.5	12.0	20.0	30.0	40.0	40.0	40.0
PIONEER	6.5	2.0	0.0	0.0	0.0	0.0	0.0
AQUILA	6.0	.5	0.0	0.0	0.0	0.0	0.0
CORPS OPS	2.0	9.5	0.0	0.0	0.0	0.0	0.0
SHORT RANGE OBJECTIVE	0.0	0.0	20.0	30.0	40.0	40.0	40.0
MEDIUM RANGE TOTAL	11.3	29.9	73.1	42.8	12.0	0.0	0.0
NAVY UARS	9.0	28.0	68.0	39.0	12.0	0.0	0.0
AIR FORCE UARS	2.3	1.9	5.1	3.8	0.0	0.0	0.0
ENDURANCE TOTAL	10.9	15.6	10.0	15.0	20.0	20.0	20.0
AMBER	10.9	15.6	0.0	0.0	0.0	0.0	0.0
ENDURANCE OBJECTIVE	0.0	0.0	10.0	15.0	20.0	20.0	20.0
RESEARCH & ADVANCED DEVELOPMENT	8.3	3.9	10.0	10.0	10.0	10.0	10.0
JOINT TECHNOLOGY CENTER	4.0	5.0	5.0	5.0	5.0	5.0	5.0
TOTALS	50.3	72.1*	128.1	117.8	97.0	80.0	80.0

*Required FY 1989 funding is $72.1M. Additional funding not reflected in the FY 1989 President's Budget, $37.4M will be reprogrammed.

B. UAV PROCUREMENT

JOINT UAV PROGRAM

PROCUREMENT

	FY88	FY89	FY90	FY91	FY92	FY93	FY94
CLOSE RANGE TOTAL	0.0	0.0	8.0	20.0	60.0	80.0	80.0
CLOSE RANGE OBJECTIVE			8.0	20.0	60.0	80.0	80.0
SHORT RANGE TOTAL	45.4	65.6	19.1	50.2	78.1	131.2	180.0
PIONEER	45.4	26.9	14.1	13.2	12.1	11.2	0.0
AQUILA	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CORPS OPS	0.0	38.7	5.0	7.0	6.0	0.0	0.0
SHORT RANGE OBJECTIVE	0.0	0.0	0.0	30.0	60.0	120.0	180.0
MEDIUM RANGE TOTAL	0.0	0.0	0.0	41.7	151.3	229.3	287.3
NAVY UARS	0.0	0.0	0.0	14.8	90.0	150.0	200.0
AF UARS	0.0	0.0	0.0	26.9	61.3	79.3	87.3
ENDURANCE TOTAL	0.0	0.0	3.0	20.0	40.0	40.0	40.0
ENDURANCE OBJECTIVE	0.0	0.0	3.0	20.0	40.0	40.0	40.0
TOTALS	45.4	65.6	30.1	131.9	329.4	480.5	587.3

* Procurement includes airframes, payloads, sensors, data links, ground stations, mission planning and control system (MPCS), and Launch and Recovery Systems.

C. RELATED PROGRAMS

RDT&E

RELATED UAV PROGRAMS

RDT&E

	FY88	FY89	FY90	FY91	FY92	FY93	FY94
USMC EXDRONE (P.E. 0604270N)	0.9	0.2	0.2	0.0	0.0	0.0	0.0
*NSA SKYDANCER (P.E. 0305885G)							
MEDFLI/SILENT FOX (Nunn)	4.0	4.0	5.0	0.0	0.0	0.0	0.0
RAVEN (Nunn)	1.4	1.1	0.0	0.0	0.0	0.0	0.0
CL-227 (Nunn)	2.8	0.0	0.0	0.0	0.0	0.0	0.0
SPRITE (Nunn)	1.1	0.7	0.0	0.0	0.0	0.0	0.0
TOTALS	10.2	6.0	5.2	0.0	0.0	0.0	0.0

*See classified Annex, Appendix F for SKYDANCER funding.

D. RELATED PROGRAMS

PROCUREMENT

RELATED UAV PROGRAMS

PROCUREMENT

	FY88	FY89	FY90	FY91	FY92	FY93	FY94
USMC EXDRONE (P.E. 0604270N)*	0.0	0.0	1.9	2.3	3.4	0.1	0.1
TOTALS	0.0	0.0	1.9	2.3	3.4	0.1	0.1

*EXDRONE, as an expendable, is procured with O&MMC funding.